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(54) **Electronic feeder apparatus for automatically controlling the tension of the yarn in a knitting machine and textile machines in general**

Elektronische Fadenliefervorrichtung für die automatische Regelung der Fadenspannung an einer Stickmaschine oder an Textilmaschinen im Allgemeinen

Dispositif d'alimentation en fil électronique pour le contrôle automatique de la tension du fil dans un métier à tricoter ou dans des machines textiles en général

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(73) Proprietor: **Paggiaro, Angelo**  
**21013 Gallarate (Varese) (IT)**

(72) Inventor: **Paggiaro, Angelo**  
**21013 Gallarate (Varese) (IT)**

(74) Representative: **Cicogna, Franco**  
**Ufficio Internazionale Brevetti**  
**Dott.Prof. Franco Cicogna**  
**Via Visconti di Modrone, 14/A**  
**20122 Milano (IT)**

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## Description

### BACKGROUND OF THE INVENTION

The present invention relates to an improved feeder apparatus for automatically controlling the tension of a yarn, including an electronic device for detecting possible faults, which can be applied to machines for making fabrics, knitted fabrics and cloth articles, and to textile machines in general.

As is known, in knitting machines and other textile machines there are usually provided several yarn feeders which conventionally comprise two small levers, articulated at different articulation points, which cooperate with corresponding switches.

These switches are independent from one another and are adapted to disenergize the machine as a yarn is broken, by signalling a possible breakage of a yarn by means of individual light displays.

Also known is the fact that conventional circular knitting machines are supplied with a lot of yarns, usually in a number from 60 to 84 and even up to 120 and above, thereby, in order to make an even and satisfactory fabric product, it is necessary to perform, very frequently, a control of the tension of the yarns, immediately upstream of the yarn inlet to the machine.

This verification is at present performed manually, yarn by yarn, by using mechanical or electronic tension measuring devices, which must be held in a hand of the operator, whereas the operator, by his other hand, adjusts the knitted fabric.

A system according to the preamble of independent claim 1 is known from DE-C-3 824 034. The yarn feeders of this system are linked to a central control unit which signals the type of failure to the operator and stops the knitting machine.

However, in prior knitting machines, the operator having the job of controlling possible faults of the yarn feeders, must walk about the machine, which can have a diameter up to 2.5 metres, in order to detect the yarn feeder the yarn of which is broken.

This, as it should be apparent, requires a lot of time with a consequent decrease of the textile machine yield.

Moreover, the delays in recovering the proper operation of the machine are further increased by the fact that the individual displays, provided for displaying the yarn breakages, are frequently scarcely visible because of powder and the like, and because of the high lighting usually provided in the textile machine room.

Actually, the textile machine is frequently stopped, with a consequent loss of time by the operator, even if the machine is not in a fault condition.

This drawback occurs because possible small impacts, or increases of the tension of the yarns, of very short duration, due, for example, to a badly wound bobbin or during the period between the end of a bobbin and the start of a subsequent bobbin, or, moreover because of dirt accumulated between the yarn braking

discs.

Accordingly, the above mentioned temporary variations of the tension of the yarns, which cause the related movable mechanical lever to vibrate, are sufficient to cause the textile machine to stop since the lever undesirably impacts against the corresponding switch.

### SUMMARY OF THE INVENTION

Accordingly, the aim of the present invention is to overcome the problems and drawbacks thereinabove mentioned, by providing an improved feeder apparatus which allows a continuous control of the tension of the yarn before the supplying of said yarn to the textile machine, and which, moreover, comprises an electronic display device for displaying and controlling, in a centralized way, possible faults, which electronic device also includes auto-diagnosis means adapted to allow an operator to easily and quickly repair a feeder which has been detected in a fault condition.

Within the scope of the above mentioned aim, a main object of the present invention is to provide such an improved feeder which is so designed as to greatly facilitate the job of the operator, so as to provide optimum conditions from the yield standpoint.

Another object of the present invention is to provide such a yarn feeder for textile machines which can feed its yarn without being negatively affected by dirt and the like.

Yet another object of the present invention is that of providing a yarn feeder which is very reliable and safe in operation and, moreover, is very competitive from a mere economic standpoint.

According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an improved feeder apparatus for automatically controlling in real time the tension of a textile yarn, said feeder apparatus including an electronic multiple function device, and being provided for application to knitting machines and textile machines in general, characterized in that said feeder apparatus comprises a device applied to a lever for continuously controlling the tension of the yarn, before the inlet of said yarn into said textile machine, and a device for displaying and controlling possible faults of said feeder apparatus, said lever being a swinging lever arranged downstream of a drum and operating for controlling the position of an adjustable movable shield element adapted to intercept light, thermal or electromagnetic radiations; said shield being arranged between a radiation emitting element and a radiation sensing element, in order to chop the amount of radiations received by the sensor which transforms the received radiation amount into an electronic signal proportional to said radiation amount, said signal, which can be suitably amplified, controlling, depending on its amplitude, a display of the yarn tension, depending also on the swinging amplitude of said

lever.

## BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the yarn feeder apparatus according to the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment thereof, which is illustrated, by way of an indicative, but not limitative example, in the figures of the accompanying drawings, where:

Figure 1 is a perspective view of the improved yarn feeder apparatus, for automatically controlling the tension of the yarn, and including a multiple function electronic device for performing a centralized display and control of possible faults, according to the present invention;

Figure 2 is a front view of that same improved feeder apparatus shown in Figure 1;

Figure 3 is a rear view of the improved feeder apparatus shown in Figure 1;

Figure 4 is a side view of the subject feeder apparatus, in a working condition thereof, with the yarn under tension;

Figure 5 is another side view of the improved feeder apparatus, in a working condition thereof, with the yarn free of tension;

Figure 6 is a further side view of the improved feeder apparatus, with the yarn in a loose condition;

Figure 7 is a schematic view of the improved feeder apparatus according to the present invention, in which there is clearly shown a coding card and a further electronic card controlling the tension of the yarn;

Figure 8 is an electric connection diagram showing the electric connections of the several coding electronic cards connected to the individual yarn feeders, in a knitting machine, and a central control card or board, of the subject electronic device for performing a centralized display and control of faults, also according to the present invention;

Figure 9 illustrates a block diagram of a preferred, though not limitative, embodiment of the coding card or board;

Figure 10 illustrates a further block diagram of the central control card, according to a preferred embodiment thereof;

Figure 11 illustrates an electric diagram of the device for continuously controlling the tension of the yarn, before the supplying of said yarn to the textile machine;

Figure 12 is a schematic view, on an enlarged scale, illustrating the principle thereon is based the device for continuously controlling the tension of the yarn.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the number references of the figures of the accompanying drawings, the improved feeder apparatus according to the present invention, which has been generally indicated at the reference number 1, comprises a device for continuously controlling the tension of the yarn, before supplying said yarn to the textile machine, and an electronic device for displaying and controlling, in a centralized manner, possible faults occurring in said feeder.

Each textile machine will be provided with a plurality of these feeder apparatus.

In this feeder, the yarn 2, supplied by a yarn supply R (not shown) is guided by a first transmission bush element 3, so as to pass through a brake 4 comprising two opposite discs 6, the clamping of which can be adjusted in a known way.

Before deviation by an eye element 8, the yarn will support the first lever 50, adapted to operate in the case of a breakage of the yarn; then, this yarn will be wound by several turns about a drum 10 including a plurality of slots.

The rotation of this drum is driven by a pulley 12, coaxially rigid with the drum and driven by a toothed belt.

Before its supply to the textile machine M, the yarn 2 passes through a further eye element 14 and on a second bush element 16.

Between these two passages, the yarn rests on the second movable lever 20, responsive to the tension of the yarn, and articulated on the housing 1 at a transversal axis 21.

As it is clearly shown in Figure 4, the lever 20 is provided with a cross-piece 24, bearing on the yarn 2.

This lever 20 is urged to move in the direction of the arrow F, under the action of a suitable counterweight element, or a blade spring, as it will be disclosed in a more detailed way hereinafter.

Figure 5 shows the position of the lever 20 in a normal tension condition of the yarn which follows a broken line.

If the yarn is greatly tensioned, as it is shown in Figure 4, then the path assumed by said yarn, between the bush element 16 and drum 10, will be substantially rectilinear, since the lever 20 is urged to upwardly raise.

On the contrary, if the tension on the yarn is small, then the lever 20 will be arranged in a substantially vertical position, by causing the yarn 2 to assume the configuration shown in Figure 6.

The principle on which the yarn tension controlling device according to the invention is based is schematically shown in Figure 12.

In this Figure there are shown, on an enlarged scale, two end positions L and T of the lever 20, which substantially correspond to Figures 6 and 4, and respectively related to the loose condition of the yarn and to the very tensioned condition thereof, as well as any in-

intermediate positions N represented by a dashed line, corresponding, for example, to a normally tensioned condition of the yarn (see Figure 4).

At the articulation point 21, as an extension of the arm of the lever 20, there is provided an arm 30, rigid with said lever, to which there is applied, according to the above mentioned device, a shield, indicated at the reference number 32, either of the fixed or of the adjustable type, adapted to shut off a flow 34 of any suitable type of radiation, for example light, magnetic or thermal radiations, as emitted by an emitter 36 and directed to a radiation sensor 38.

As shown in Figure 12, at the position L of the lever 20 (as indicated by the continuous line), the shield 32 will fully shut-off the radiation beam 34 directed toward the sensor 38; in the normal position N (as indicated by the dashed line), the shut-off is partial, whereas in the position T (see the line constituted by the small dashes) the shut-off is zero.

To these shut-off conditions, correspond related different values of the electric voltage generated by the sensor 38.

The electric diagram of the first device thereinabove disclosed is shown in Figure 11.

In this figure, the emitter element 36, supplied by a line 37, will irradiate toward the receiving sensor 38, a flow 34 of radiations which are variably shut-off or intercepted by the shield 32 connected to the arm 30 of the lever 20, depending on the position of the latter.

The voltage available at the output of the sensor 38 will be suitably amplified, if necessary, by an amplifier 45 in order to turn-on a plurality of diode assemblies 50, 51, 52 of different colours, preferably red, green and yellow, in order to signal, in a differentiated way, the related strictly dependant degree of tension of the yarn, as shown above, which will depend on the angular position of the lever 20.

More specifically, under a normal tension condition of the yarn, the green LED's will be energized, whereas in a great tension condition of the yarn the red LED's will be energized, and in a loose condition of the yarn the yellow LED's will be energized.

The diodes 50, 51 and 52 are assembled on a diode card 40, arranged at any suitable position in the housing of the yarn feeder, or are inserted in said card, as shown in figure 4.

The above disclosed electronic device for displaying and controlling in a centralized way possible faults of the yarn feeders, according to the present invention, is provided with a very important feature, i.e. that the switches, indicated at the reference numbers 104 and 106 in figure 7, and integrated with the above mentioned levers, are operatively connected to a coding card, generally indicated at the reference number 110.

The latter is connected in parallel to an electric line, overall indicated at the reference number 111, which is of the two-wire type and is connected to a central control card, generally indicated at the reference number 120.

On the line 111 there are parallel connected all the cards 110 which correspond to the individual yarn feeders (see figure 8).

More specifically, the line 111 comprises a wire 111a which carries the supply current for the cards 110, and a second wire 111b, which carries the signals processed by the several cards 110, both said wires being connected to the control card 120.

Moreover, the individual cards 110 are individually connected to ground.

The central control card 120, in turn, is power supplied through the line 121 and includes an output line 122 in order to stop the operation of the textile machine.

Moreover, the cards 120 drive, through a line 123, a display 124 adapted to display, by means of a digital type of display, the yarn feeder which is under a fault condition.

Moreover, at the output of the card 120 there is moreover provided an auxiliary line 125, which is interconnected to an interface 126 for driving a processor 127.

With the disclosed arrangement, the centralized displaying is performed by introducing, into each yarn feeder, a coding electronic card 110, each of which is responsive to the switching state of the switches 104 and 106 which will signal, through the operation of the levers 20 and 50, the good condition of the yarn or the tension condition thereof.

The control card is so programmed as to make visible, on the display 124, preferably of the three digit type, the number of the switched on or off switch, as well as their locations, for example high for the breakage of the yarn supplied to the accumulating drum and low for a breakage of the yarn at the output of said drum.

Each codifying or coding electronic card is supplied from the first of the two connecting lines with return to ground.

The first line of wire 111a receives and transmits to the central control card the signals of each individual codifying or coding card, as it has been already disclosed.

The control card verifies, sequentially, the conditions of the coding cards, connected to the switches related to the individual yarn feeders.

As a fault occurs, the central control card will display the distinctive number of the first switch, the condition of which has switched, and, simultaneously, it will stop the textile machine, so as to allow the operator to recover the good operation conditions.

Only upon actuating a reset function by the operator, said control card will continue to cyclically and sequentially diagnose another possible malfunction or fault, susceptible to occur at a subsequent position.

In this connection it should be pointed out that the above mentioned reset operation can also be performed automatically, as the operator resets the lever which has been brought to a lowered position.

Under such an event, the control card will continue

its search of a possible fault and, if not, then the display will remain in an off condition until another subsequent malfunction is detected.

The central control card 120, as it is clearly shown in figure 10, comprises an oscillator 130, which generates a signal having a frequency of 10/20 KHz, and sends it to a binary counter 132, programmable for 64, 128, 192, 256 pulses in order to fit the knitting machines having a different number of yarn feeders.

The first pulse is used for performing a zeroing operation, and accordingly 63, 127, 191, 255 pulses will be respectively available.

The unit 134 provides the zeroing or clearing signal, having a voltage from 0 to 6 volt, and will send these signals to a buffer 136 which will amplitude modulate the signals.

Through the buffer 136 further pass the signals sent by a decimal counter 140.

By means of the absorbing detector 144, as a coding card passes to an alarm condition, because of an operation of a switch, then a great current drain occurs and then the unit 152 will cause the textile machine to stop its operation through the relay 156, will switch on the display 124 and lock the oscillator 130 and counters 132 and 140. The display, as stated, is a three digit display, and it displays the precise number of the yarn feeder where the alarm has been energized, and, moreover, it will also signal if the switch is high or low, that is related to the levers 20 or 50.

A reset pushbutton 150 is moreover provided, which is connected to an unit 152 which will start again, after a locking, the counting system.

A switch 160 actuates a relay 161, which allows the low switches to be inhibited, that is the levers 50.

In this case the textile machine can operate exclusively by pulses.

Each coding card, as is clearly shown in figure 9 has an input for the signals or pulses coming from the central control card 120, which signals are supplied to an analogic comparator 173 which will detect the "high" signal (6 V) and will clear the counter 175.

The second analogic comparator 174 will detect the "low" (3 V) signals and will enable the counter 175 counting operation.

The counter 175 will send its output pulses to the digital comparator 176, which controls the switch 106, and to the comparator 177, which control the switch 104, said comparators being connected to a dipswitch 178, to each individual coding card corresponding a different number of the dipswitches.

By way of example, if the dipswitch is set on the number 10, in order to better understand the operation of a coding card, then the counter 175 will start to count.

At the first pulse, the digital comparator (176/177) will receive "1" from the counter 175 and 10 from the dipswitch 178; at the second pulse it will have "2", on a side, and 10, on the other, and so on until it will have 10 on both sides.

Now, the coding card self-recognizes itself and will control if one of the switches 104 or 106 has been energized.

If not, then the counting operation continues.

If, on the contrary, a switch has been actuated, then a comparatively high amplitude signal is generated, which will increase the current drain to about 10/15 mA, and is sent in the same time in which the count was 10, and on the same line of the 3 volt pulses, thereby the alarm is energized.

In order to prevent false alarms from occurring, due, as stated, to momentary vibrations of the yarn, the control card is programmed so as to delay by few milliseconds the actual stopping of the textile machine, so as to overcome, without any stop, several possible transitory faults which do not affect the evenness of the product.

Exclusively if the anomalous tension condition of the yarn continues beyond the set time, then the textile machine will be stopped and the related display will be provided on the display device.

It is moreover provided a built-in auto-diagnosis system of the control card, so that, if a fault occurs in said control card, then this will be signalled and the textile machine stopped.

Finally, it is provided that the control card, through the interface, can communicate to a computer; the number of occurred interruptions on each switch, so as to provide useful diagnostic data in order to aid the operator to detect the causes of the single repetitive faults, at a given region of the textile machine.

From the above disclosure it should be apparent that the invention fully achieves the intended aim and objects.

In particular the fact is to be pointed out that an electronic device has been provided which allows an operator to easily and quickly detect a possible fault yarn feeder.

The invention, as disclosed, is susceptible to several modifications and variations all of which come within the scope of the inventive idea as defined by the claims.

Moreover, all of the details can be replaced by other technically equivalent elements.

In practicing the invention, the used materials, as well as the contingent size and shape can be any according to requirements.

## Claims

1. A system comprising a yarn feeder apparatus (1) for automatically controlling in real time the tension of a textile yarn (2) and a central control device, the yarn feeder apparatus (1) comprising an electronic control device, a yarn tension control lever (20) for continuously controlling the tension of the yarn, being supplied to a textile machine, a device for displaying and controlling possible faults of said feeder

- apparatus, said lever (20) being a swinging lever arranged downstream of a yarn accumulating drum (10) and operating for controlling the position of an adjustable movable shield (32) adapted to intercept light, thermal or electromagnetic radiations, said shield (32) being arranged between a radiation emitting element (36) and a radiation sensor (38), in order to chop the amount of radiations received by said sensor (38) which transforms the received radiation amount into an electronic signal proportional to said radiation amount and controlling a yarn tension display, said lever (20) being responsive to the tension of said yarn and being urged so as to adhere to said yarn (2), and said yarn accumulating drum (10) being provided with dirt removing slots and being of a positive accumulation type characterized in that lever urging means cause said lever (20) to upwardly rise as said yarn (2) is greatly tensioned and to assume a substantially vertical position as said yarn is slightly tensioned, in that said electronic control device comprises a codifying card (110) which controls switching means (104,106) and is coupled by two coupling wires to a central control card (120), and in that the central control card (120) is adapted to detect an actuated switch of said switching means, to drive a display (124) for displaying an involved feeder means, and to stop the operation of said textile machine.
2. A system according to Claim 1, characterized in that said shield (32) comprises a sheet element applied to an arm (30) and lying in a plane which is substantially parallel to that of said lever (20), so that, at the end angular positions assumed by said lever (20), respectively with the yarn very tensioned or very loose, the amount of radiation received by said sensor is maximum or nearly zero, with intermediate positions corresponding to intermediate amounts of received radiation, in turn corresponding to intermediate tensions of said yarn.
  3. A system according to Claims 1 and 2, characterized in that the radiation emitter (36) comprises a light-emitting device, and the radiation sensor (38) comprises a photosensor.
  4. A system according to one or more of the preceding claims, characterized in that said yarn tension display (40,51,52,53) is of an analogic type.
  5. A system according to one or more of the preceding claims, characterized in that said yarn tension display (40) comprises a plurality of light emitting diodes (51,52,53) of different colours, the energizing of which corresponds to set yarn tension ranges.
  6. A system according to one or more of the preceding claims except claim 4, characterized in that said yarn tension display (40) is of a digital type.
  7. A system according to one or more of the preceding claims, characterized in that at least the assembly comprising the radiation emitter (36), movable shield (32) and radiation sensor (38) is contained within the housing of the yarn feeder apparatus.
  8. A system according to one or more of the preceding claims, characterized in that the codifying cards (110) are connected to the control card (120) by means of a two-wire line (111), one (111a) of the wires of which being adapted to supply with a direct current and with a two-ground return said cards, and the other wire (111b) of said line providing a connection line for detecting a switching condition of said switching means (104,106) of each card (110).
  9. A system according to one or more of the preceding claims, characterized in that said codifying card comprises at least an analogic comparator (173,174) and a digital comparator (176), a 8-bit counter (175) and a dipswitch (178).
  10. A system according to one or more of the preceding claims, characterized in that said codifying card comprises a microprocessor (127).
  11. A system according to one or more of the preceding claims, characterized in that said central control card (120) comprises an oscillator (130), two counters (132,140), one of which is programmable in 64, 128, 192, 246 pulses, two comparators (176,177), an absorption detector (144) and a multiple digit display (124).
  12. A system according to one or more of the preceding claims, characterized in that said central control card is adapted for interconnection, through an interface, to a computer.
  13. A system according to one or more of the preceding claims, characterized in that there are further provided one or more large size displays (124) connected to said central control card (120).
  14. A system according to one or more of the preceding claims, characterized in that said central control card comprises control means (152) for stopping said textile machine.
  15. A system according to one or more of the preceding claims, characterized in that said switching means (104,106) are connected to an electric cable including one or two wires, the codifying card operation being assured by a further cable (111) including at least two wires (111a,b) and coupled to said control

card (120).

16. A system according to one or more of the preceding claims, characterized in that said apparatus further comprises a further two-wire cable (121, 122, 123) connected to said control card (120).

17. A system according to one or more of the preceding claims, characterized in that at least one (111b) of said wires is a connection wire for allowing said control card to detect the switching condition of said switching means.

18. A system according to one or more of the preceding claims, characterized in that the two-wire supply line (111a) of said codifying cards (110) is used to supply the codifying cards (110) and stop the textile machine, by means of said switching means (104, 106), whereas the detection by said control card (120) is performed by a radio-system or light beams, sent from said codifying cards (110).

19. A system according to one or more of the preceding claims, characterized in that each codifying card (110) is arranged inside the feeder (1).

20. A system according to claim 12 and 14, characterized in that said central card (120) comprises a microprocessor (127) driving the several display functions, as well as the control functions and the direct coupling with the computer and the means (152) for stopping said textile machine.

21. A system according to one or more of the preceding claims, characterized in that said apparatus (1) is provided with a top having a bulged surface or slant walls.

#### Patentansprüche

1. Ein System, umfassend eine Fadenzuführvorrichtung (1), um automatisch die Spannung eines Textilfadens (2) in Echtzeit zu steuern, sowie eine zentrale Steuereinheit, wobei die Fadenzuführvorrichtung (1) eine elektronische Steuereinheit umfaßt, einen Hebel (20) zur Steuerung der Fadenspannung, um die Spannung des Fadens, der einer Textilmaschine zugeführt wird, kontinuierlich zu regeln, und eine Vorrichtung, um mögliche Störungen dieser Zuführvorrichtung anzuzeigen und zu steuern, wobei dieser Hebel (20) ein Kipphebel ist, der unterhalb einer Fadensammelrolle (10) angebracht ist und so wirkt, daß er die Stellung eines einstellbaren, beweglichen Schildes (32) steuert, der angepaßt ist, Licht bzw. thermische oder elektromagnetische Strahlung abzufangen, wobei dieser Schild (32) zwischen einer Strahlungsquelle (36) und ei-

nem Strahlungssensor (38) angebracht ist, um die von diesem Sensor (38) empfangene Strahlungsmenge aufzuteilen, der dann die empfangene Strahlungsmenge in ein elektronisches Signal umwandelt, das zu dieser Strahlungsmenge proportional ist, und eine Anzeige für die Fadenspannung steuert, wobei dieser Hebel (20) auf die Spannung dieses Fadens anspricht und so gespannt wird, daß er an diesem Faden (2) anliegt, und diese Fadensammelrolle (10) mit Schlitzzen zur Entfernung von Verunreinigungen ausgestattet ist und vom Typ der positiven Zunahme ist, dadurch gekennzeichnet, daß eine Hebelspannvorrichtung bewirkt, daß sich dieser Hebel (20) anhebt, wenn dieser Faden (2) stark gespannt ist, und er eine im wesentlichen vertikale Stellung einnimmt, wenn dieser Faden schwach gespannt ist, und daß diese elektronische Steuervorrichtung eine Codierkarte (110) umfaßt, die die Schaltvorrichtung (104, 106) steuert und mittels zweier Verbindungsdrähte an eine zentrale Steuerkarte (120) gekoppelt ist, und daß die zentrale Steuerkarte (120) angepaßt ist, die Betätigung eines Schalters dieser Schaltvorrichtung zu erfassen, um eine Anzeigevorrichtung (124) zu steuern, die eine davon abhängige Zuführvorrichtung anzeigt, und den Betrieb dieser Textilmaschine zu stoppen.

2. Ein System nach Anspruch 1, dadurch gekennzeichnet, daß dieser Schild (32) eine Tafel umfaßt, die an einem Arm (30) angebracht ist und in einer Ebene liegt, die zu jener des Hebels (20) im wesentlichen parallel verläuft, so daß an den terminalen Winkelstellungen dieses Hebels (20), jeweils bei sehr stark oder sehr gering gespanntem Gam die Menge der von diesem Sensor empfangenen Strahlung ein Maximum erreicht bzw. nahe Null ist, wobei Zwischenstellungen dazwischenliegenden Mengen von empfangener Strahlung entsprechen, die ihrerseits mittleren Spannungen dieses Fadens entsprechen.

3. Ein System nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß die Strahlungsquelle (36) eine Lichtquelle und der Strahlungssensor (38) einen Photomeßfühler umfaßt.

4. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese Anzeigevorrichtung (40, 51, 52, 53) für die Fadenspannung vom analogen Typ ist.

5. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese Anzeigevorrichtung (40) für die Fadenspannung eine Vielzahl verschiedenfarbiger Lumineszenzdioden (51, 52, 53) umfaßt, deren Betriebszustand vorgegebenen Bereichen der Fadenspan-

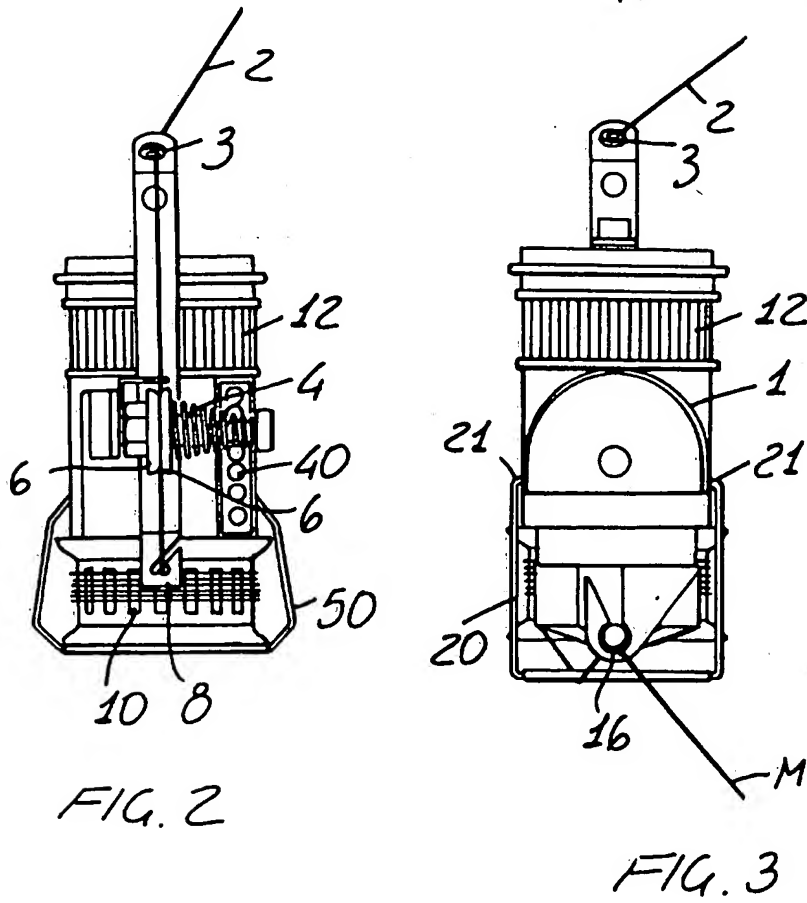
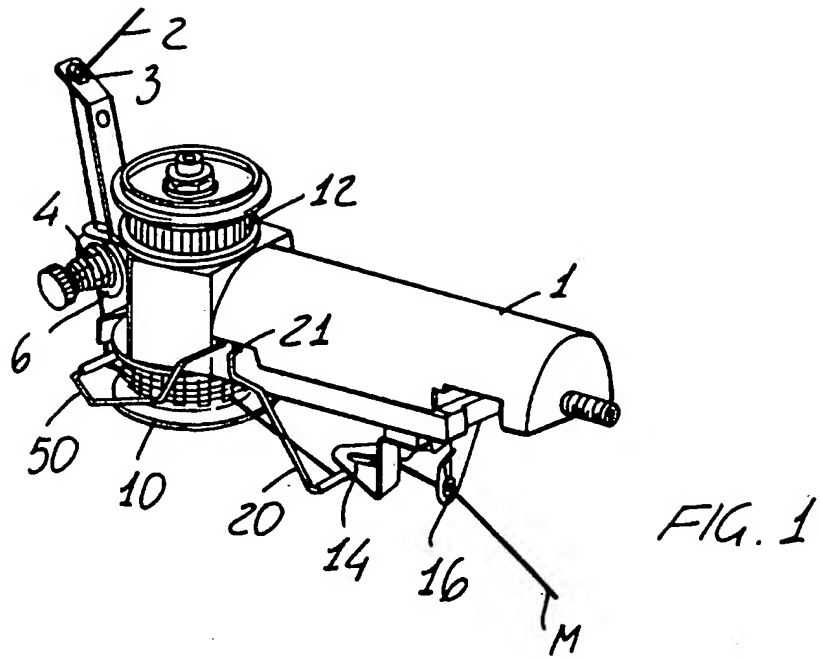
- nung entsprechen.
6. Ein System nach einem oder mehreren der vorstehenden Ansprüche, außer Anspruch 4, dadurch gekennzeichnet, daß diese Anzeigevorrichtung (40) für die Fadenspannung vom digitalen Typ ist. 5
  7. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß zumindest die Baugruppe, die die Strahlungsquelle (36), den beweglichen Schild (32) und den Strahlungssensor (38) umfaßt, im Gehäuse der Fadenzuführvorrichtung enthalten ist. 10
  8. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Codierkarten (110) mit der Steuerkarte (120) über eine zweiadrige Leitung (111) verbunden sind, deren eine (110a) Ader angepaßt ist, diese Karten mit einem Gleichstrom und einem doppelt geerdeten Rückkehrpfad zu versorgen, wobei die andere (111b) Ader dieser Leitung eine Verbindungslinie bereitstellt, um einen Schaltzustand dieser Schaltvorrichtung (104, 106) jeder Karte (110) zu erfassen. 15 20 25
  9. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese Codierkarte zumindest ein analoges Vergleichsglied (173, 174) und ein digitales Vergleichsglied (176), einen 8-Bit Zähler (175) und einen Dip-Schalter (178) umfaßt. 30
  10. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese Codierkarte einen Mikroprozessor (127) umfaßt. 35
  11. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese zentrale Steuerkarte (120) einen Oszillator (130) und zwei Zähler (132, 140), von denen einer auf 64, 128, 192 und 256 Impulse programmierbar ist, umfaßt, sowie zwei Vergleichsglieder (176, 177), einen Absorptionsfühler (144) und eine mehrstellige Zahlenanzeige (124). 40 45
  12. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese zentrale Steuerkarte angepaßt ist, über eine Schnittstelle an einen Computer angeschlossen zu werden. 50
  13. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß weiterhin ein oder mehrere große Bildschirme (124) bereitgestellt sind, die an dieser zentralen Steuerkarte (120) angeschlossen sind. 55
  14. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese zentrale Steuerkarte eine Steuervorrichtung (152) umfaßt, um diese Textilmaschine anzuhalten. 5
  15. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese Schaltvorrichtungen (104, 106) an ein elektrisches Kabel angeschlossen sind, das ein oder zwei Drähte umfaßt, wobei der Betrieb der Codierkarte durch ein weiteres Kabel (111) sichergestellt ist, das mindestens zwei Drähte (111a, b) umfaßt und mit dieser Steuerkarte (120) gekoppelt ist. 10
  16. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß diese Vorrichtung ferner ein weiteres zweiadriges Kabel (121, 122, 123) umfaßt, das mit dieser Steuerkarte (120) verbunden ist. 15
  17. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß zumindest eine (111b) dieser Leitungen eine Verbindungsleitung ist, die es dieser Steuerkarte ermöglicht, den Schaltzustand dieser Schaltvorrichtung zu erfassen. 20 25
  18. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die zweiadrige Versorgungsleitung (111a) dieser Codierkarten (110) verwendet wird, die Codierkarten (110) zu versorgen und die Textilmaschine mittels dieser Schaltvorrichtung (104, 106) anzuhalten, wohingegen die Erfassung durch diese Steuerkarte (120) über ein Radiosystem oder Lichtstrahlen, die von diesen Codierkarten (110) ausgehen, erfolgt. 30 35
  19. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß sich jede Codierkarte (110) innerhalb der Zuführvorrichtung (1) befindet. 40
  20. Ein System nach den Ansprüchen 12 und 14, dadurch gekennzeichnet, daß diese zentrale Steuerkarte (120) einen Mikroprozessor (127) umfaßt, der die verschiedenen Anzeigefunktionen sowie die Steuerfunktionen und die direkte Anbindung an den Computer und die Vorrichtung (152), um diese Textilmaschine anzuhalten, umfaßt. 45 50
  21. Ein System nach einem oder mehreren der vorstehenden Ansprüche, dadurch gekennzeichnet, daß dieses System (1) mit einem Oberteil ausgestattet ist, das eine gewölbte Oberfläche oder geneigte Wände besitzt. 55

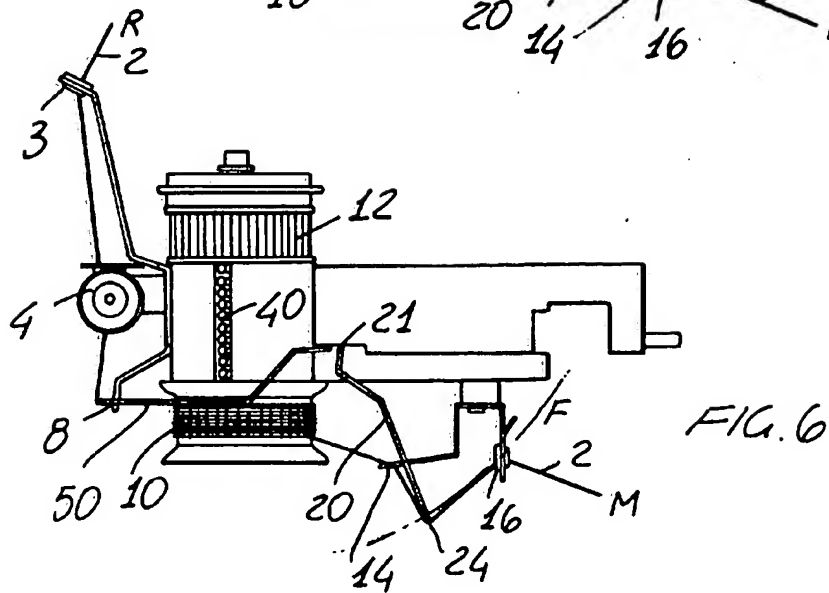
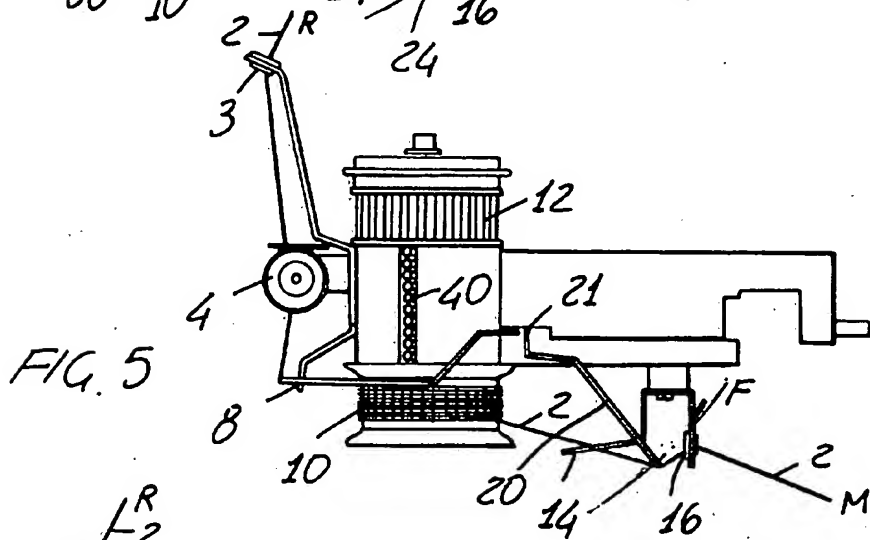
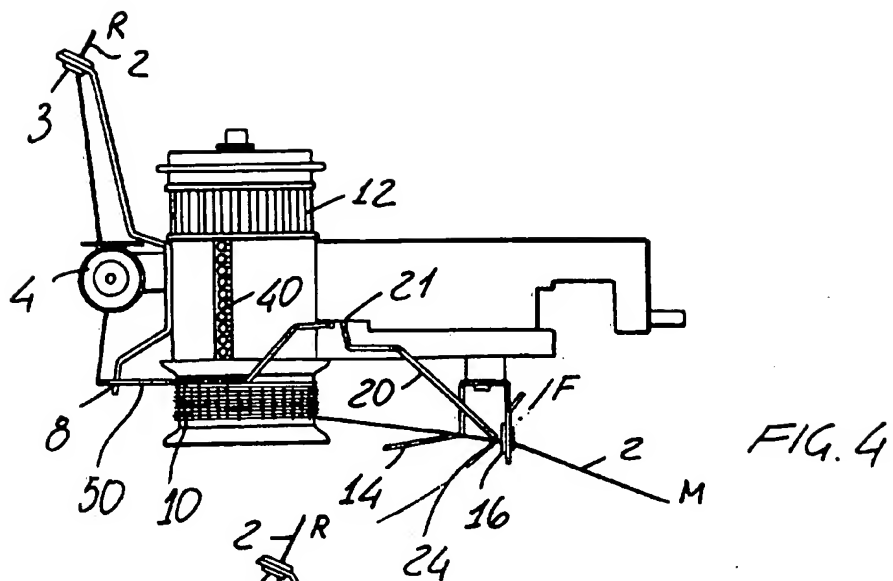


## Revendications

1. Un système comprenant un dispositif pour la livraison du fil (1), pour contrôler automatiquement et en temps réel la tension d'un fil textile (2), et un dispositif de commande central, le dispositif pour la livraison du fil (1) comprenant un dispositif de commande électronique, un levier (20) réglant la tension du fil pour contrôler en continu la tension du fil livré à une machine textile, un dispositif pour afficher et maîtriser d'éventuelles perturbations dans ledit dispositif de livraison, ledit levier (20) étant un balancier situé en aval d'un tambour (10) pour le ramassage du fil, et étant mis en oeuvre pour contrôler la position d'un écran (32) mobile et ajustable adapté à intercepter la lumière ou bien les radiations thermiques ou électromagnétiques, ledit écran (32) se trouvant entre un élément émetteur (36) de radiation et un détecteur de rayonnement (38), pour partager la quantité de rayonnement reçue par ledit détecteur (38) qui transforme la quantité de rayonnement reçu dans un signal électronique proportionnel à ladite quantité de rayonnement et commandant un dispositif visualisant la tension du fil, ledit levier (20) étant sensible à la tension dudit fil et étant tendu de façon à adhérer audit fil (2), ledit tambour (10) pour le ramassage du fil étant doté de fentes pour l'élimination des impuretés et étant du type à accumulation positive, caractérisé en ce que le moyen pour tendre le levier cause un mouvement ascensionnel dudit levier (20) lorsque ledit fil (2) se trouve sous forte tension, et lui donnant une position en substance verticale lorsque le fil est faiblement tendu, et en ce que ledit dispositif de commande électronique comprend une carte (110) de codage commandant un dispositif de commutation (104, 106) et reliée au moyen de deux conducteurs de connexion à une carte de commande central (120), et en ce que ladite carte de commande centrale (120) est adaptée à détecter un commutateur déclenché dudit dispositif de commutation pour commander un écran (124) visualisant un dispositif de livraison y dépendant et arrêter le fonctionnement de ladite machine textile.
2. Un système selon la revendication 1, caractérisé en ce que ledit écran (32) comprend un élément ayant la forme d'une feuille, appliqué à un bras (30) et situé dans un plan essentiellement parallèle à celui dudit levier (20), de manière que dans les positions angulaires limitées occupées par ledit levier (20) la quantité de rayonnement reçue par ledit détecteur correspond respectivement à un maximum ou environ à zéro lorsque le fil est fortement tendu ou dans un état lâche, des positions intermédiaires correspondant à des quantités de radiation reçue intermédiaires de leur part correspondant à des valeurs intermédiaires pour la tension dudit fil.
3. Un système selon les revendications 1 et 2, caractérisé en ce que la source de rayonnement (36) comprend un dispositif émetteur de lumière, et que le détecteur de rayonnement (38) comprend un photocapteur.
4. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit dispositif d'affichage (40, 51, 52, 53) de la tension du fil est du type analogique.
5. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit dispositif d'affichage (40) de la tension du fil comprend une multiplicité de diodes à luminescence (51, 52, 53) de différentes couleurs dont l'excitation correspond à des marges données de la tension du fil.
6. Un système selon l'une ou plusieurs des revendications précédentes, excepté la revendication 4, caractérisé en ce que ledit dispositif d'affichage (40) de la tension du fil est du type numérique.
7. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'au moins l'assemblage comprenant la source de rayonnement (36), l'écran mobile (32) et le détecteur de rayonnement (38) se trouve dans le boîtier du dispositif de livraison du fil.
8. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que les cartes de codage (110) sont connectées à la carte de commande (120) moyennant une ligne (111) à deux conducteurs, l'un (111a) des conducteurs étant adapté à fournir auxdites cartes un courant continu et un retour à deux masses, et l'autre conducteur (111b) de ladite ligne réalisant une ligne de connexion pour détecter une situation de commutation dudit dispositif commutateur (104, 106) de chaque carte (110).
9. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite carte de codage comprend au moins un comparateur analogique (173, 174) et un comparateur numérique (176), un compteur (175) à huit bits et un interrupteur à dépression (178).
10. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite carte de codage comprend un microprocesseur (127).
11. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite carte de commande centrale (120) comprend un os-

- cillateur (130), deux compteurs (132, 140) dont l'un est programmable par étapes de 64, 128, 192, 256 impulsions, deux comparateurs (176, 177), un détecteur d'absorption (144) et un écran (124) à chiffres multiples.
12. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite carte de commande centrale est adaptée à la connexion avec un ordinateur par l'intermédiaire d'une interface. 10
  13. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que des écrans (124) de grandes dimensions sont mis en oeuvre, lesquels sont connectés à ladite carte de commande centrale (120). 15
  14. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite carte de commande centrale comprend un moyen de commande (152) pour arrêter ladite machine textile. 20
  15. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que lesdits dispositifs commutateurs (104, 106) sont connectés à un câble électrique comprenant un ou deux conducteurs, le fonctionnement de la carte de codage étant assuré par un câble supplémentaire (111) comprenant au moins deux conducteurs (111a, b) et connecté à ladite carte de commande (120). 25 30
  16. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit dispositif comprend aussi un autre câble (121, 122, 123) à deux conducteurs connecté à ladite carte de commande (120). 35 40
  17. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'au moins l'un (111b) desdits conducteurs est un conducteur de connexion pour permettre à ladite carte de commande de détecter l'état de commutation dudit dispositif commutateur. 45
  18. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que la ligne d'alimentation (111a) à deux conducteurs desdites cartes (110) de codage est utilisée pour alimenter les cartes de codage (110) et pour arrêter la machine textile au moyen dudit dispositif commutateur (104, 106), tandis que la détection de la part de ladite carte de commande (120) est effectuée par un système radio ou à pinces lumineuses émis par lesdites cartes de codage (110). 50 55
  19. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que chaque carte de codage (110) est arrangée à l'intérieur du dispositif de livraison (1). 5
  20. Un système selon les revendications 12 et 14, caractérisé en ce que ladite carte centrale (120) comprend un microprocesseur (127) commandant les diverses fonction de visualisation de même que les fonctions de commande et le couplage direct à l'ordinateur et le dispositif (152) pour arrêter ladite machine textile.
  21. Un système selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit système (1) est doté d'un haut possédant une surface bombée ou des parois inclinées.





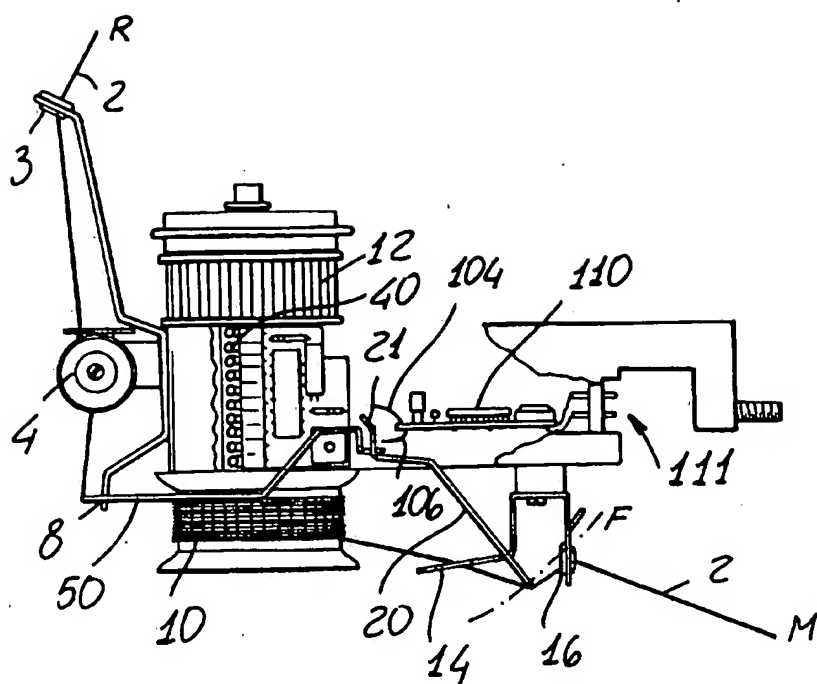


FIG. 7

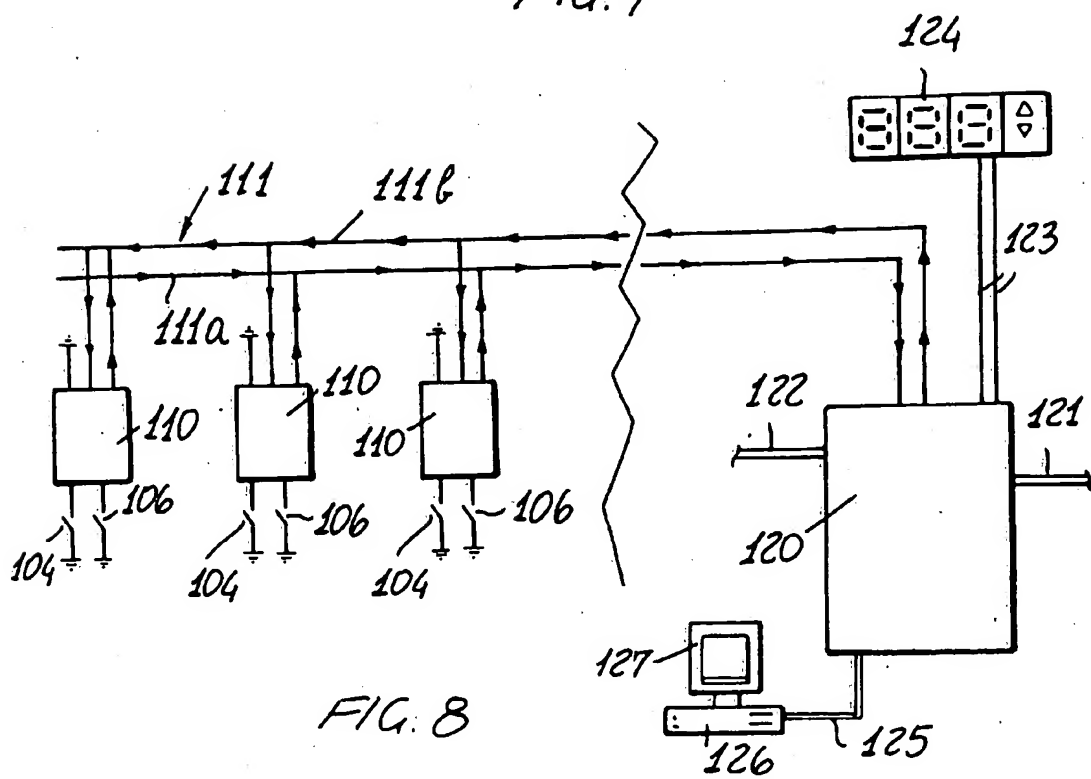


FIG. 8

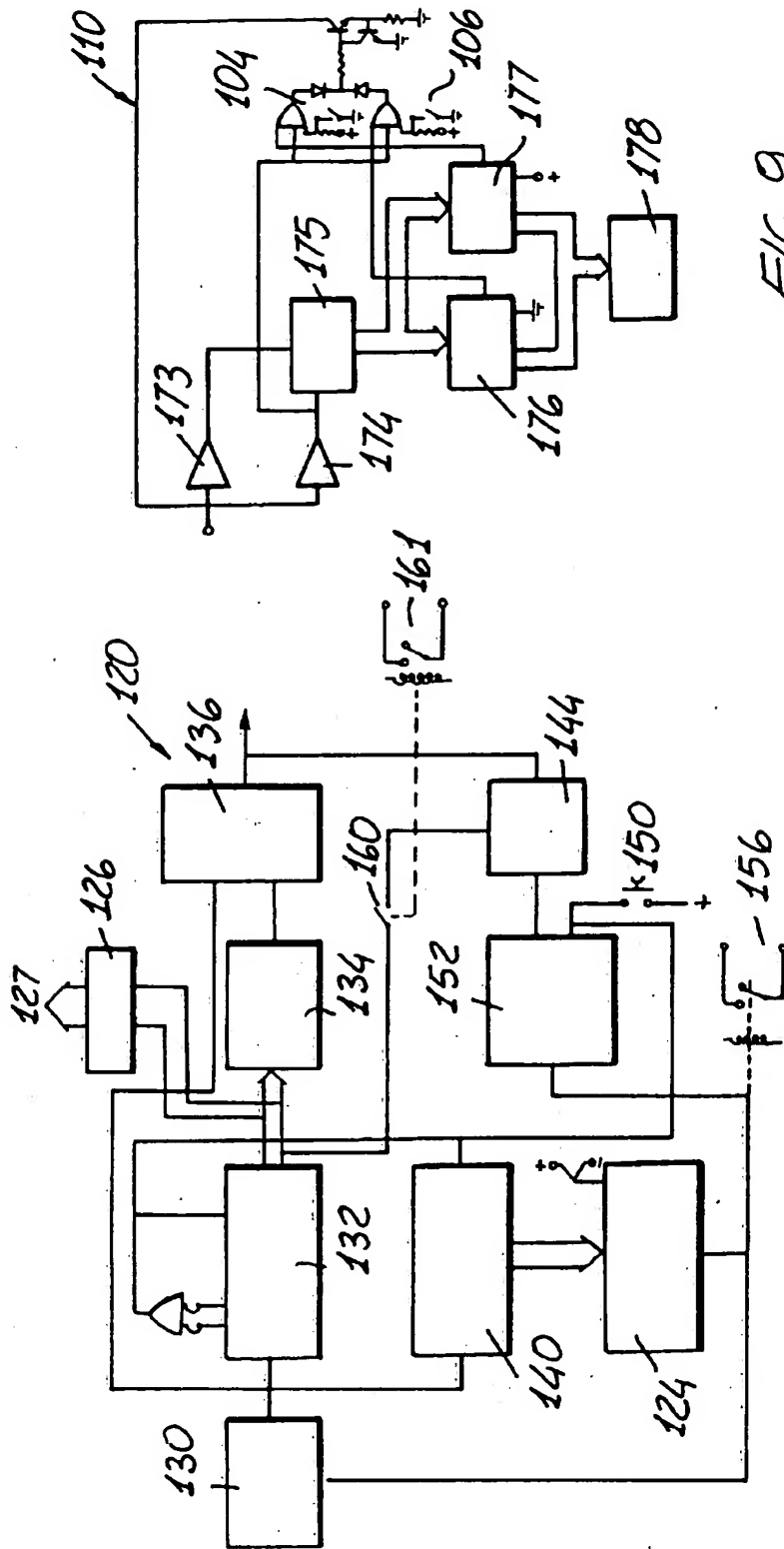


FIG. 9

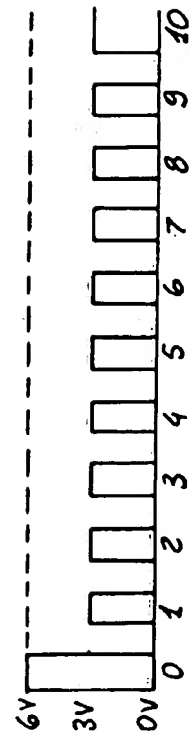


FIG. 10

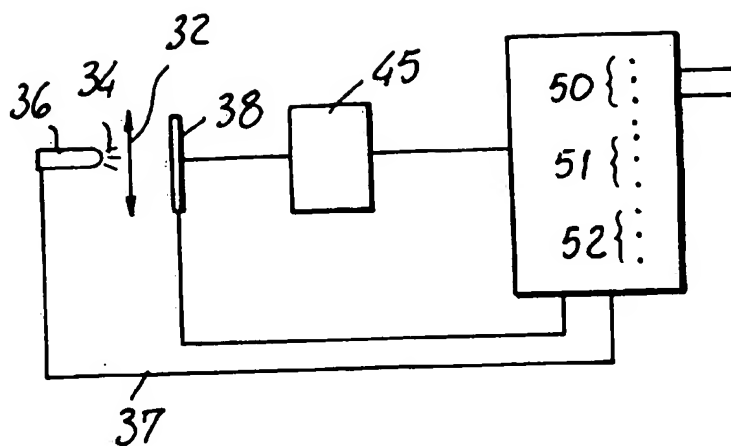


FIG. 11

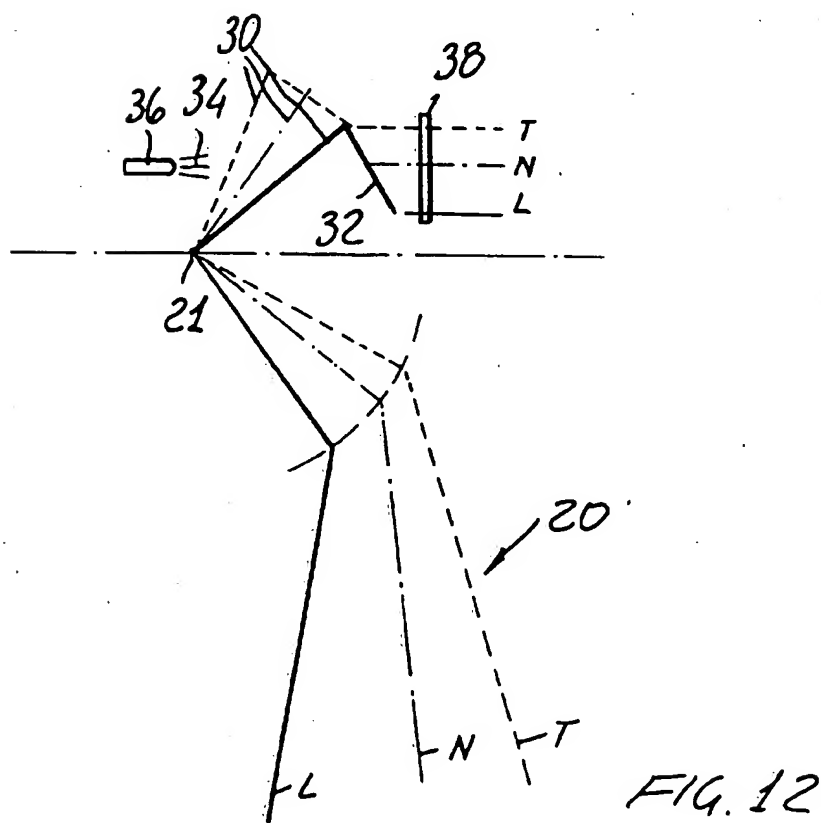


FIG. 12